K.L.E. Society's
B.V. Bhoomaraddi College of Engineering & Technology, Hubli
Department of ISE

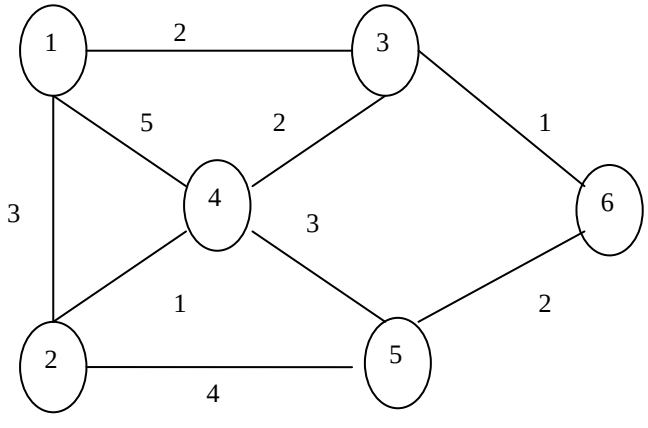
Minor Exam:	**I**	**Semester:**	**VI**
Subject:	**Computer Networks**	**Subject Code:**	**08ISC603**
Date:	**15-03-2011**	**Time:**	**8.45 to 10.00am**

Note: **Answer any two questions, Read questions carefully and interpret properly. Draw diagrams for every question**

1.a) What is NAT? What is its use? Represent the following IP address in binary notation and state its class. IP address: 208.35.54.12 **4M**

1.b) Explain ICMP as error reporting & Quarrying message. **8M**

1.c) List the phases of Link state routing technique, Consider the following topology



Use the Dijkstra algorithm to find the set of shortest paths from node 4 to other nodes **8M**

2.a) An ISP is granted a block of addresses starting with 150.80.0.0/16. this ISP wants to distribute these blocks to 2600 customers as follows

a) The first group of 200 small businesses, each needs 16 addresses

b) The second group of 400 small businesses, each needs 8 addresses

c) The third group of 2000 small business, each needs 4 addresses

Design the sub block and give the CIDR notation for each sub block. Find out how many addresses are still unused even after allocation. **8M**

2.b) Explain RARP and BOOTP. And differentiate them. **6M**

2.c) For the given routing table draw the topology of the network **6M**

Mask	**Network address**	**Next Hop**	**Interface**
/26	180.70.65.192	--	m 2
/25	180.70.65.128	--	m 0
/24	201.4.22.0	--	m 3
/22	201.4.16.0	--	m 1
/26	192.168.20.254	201.4.16.0	m 1
any	any	180.70.65.200	m 4

3.a) Explain three commonly used strategies for forwarding packets. **4M**

3.b) An IPv4 datagram has arrived with the following information in the header (in hexadecimal)
0x45 00 00 54 00 03 58 50 20 06 00 00 7C 4E 03 02 B4 0E 0F 02 **8M**

a. Is the packet corrupted?
b. Are there any options?
c. Is the packet fragmented?
d. What is the size of the data?
e. How many more routers the packet can travel?
f. What is the identification number of the packet?
g. What is the type of service?

3.c) Explain IGMP highlighting on delayed response. Change the multicast IP address 236.212.24.9 to an Ethernet multicast address **8M**

********** Wish you all the best **********

Scheme of Evaluation

1.a) What is NAT? What is its use? Represent the following IP address in binary notation and state its class. IP address: 208.35.54.12

Home users and small businesses may have created small networks with several hosts and need an IP address for each host. With the shortage of addresses, this is a serious problem.. A quick solution to this problem is called *network address translation(NAT*). NAT enables a user to have a large set of addresses internally and one address, or a small set of addresses, externally. The traffic inside can use the large set; the traffic outside, the small set.
208.35.54.12 -> 11010000.0100011.00110110.00001100 -> Class C
Figure

1.b) Explain ICMP as error reporting & Quarrying message.
Error reporting
Query message
Figures

1.c) List the phases of Link state routing technique, Consider the following topology
Stages of Link state
Routing table for Node 4

To	Cost	Next Hop
1	7	2 or 3
2	1	-
3	2	-
4	0	-
5	3	-
6	3	3

2.a) An ISP is granted a block of addresses starting with 150.80.0.0/16. this ISP wants to distribute these blocks to 2600 customers as follows

a) The first group of 200 small businesses, each needs 16 addresses

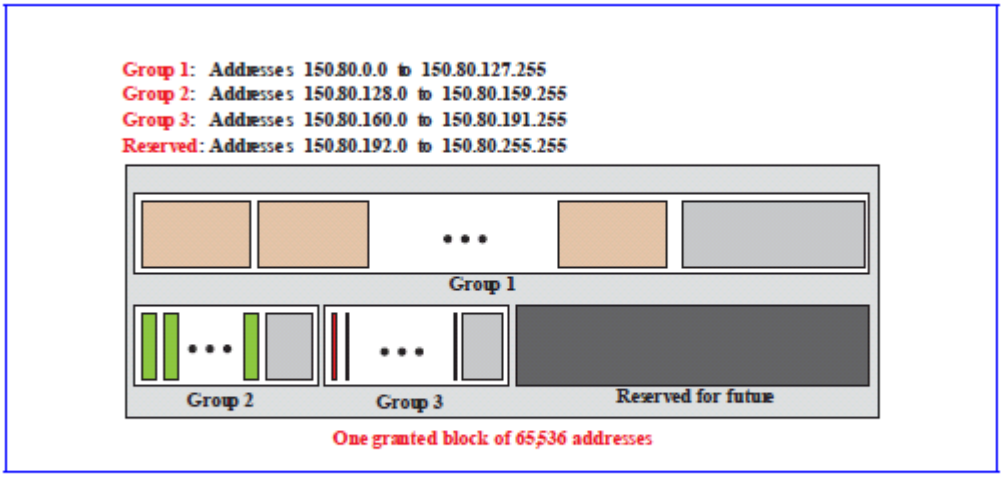
b) The second group of 400 small businesses, each needs 8 addresses

c) The third group of 2000 small business, each needs 4 addresses

Design the sub block and give the CIDR notation for each sub block. Find out how many addresses are still unused even after allocation.

The total number of addresses in this block is 2^{32-16} = **65536**. The ISP can divide this large block in several ways depending on the predicted needs of its customers in the future. We assume that the future needs follow the present pattern. In other words, we assume that the ISP will have customers that belong to one of the present groups. We design four ranges: group 1, group 2, group 3, and one reserved range of addresses as shown in Figure 19.1.

Figure 19.1 *Solution to Exercise 26*



Group 1

In the first group, we have 200 businesses. We augment this number to **256** (the next number after 200 that is a power of 2) to let 56 more customers of this kind in the future. The total number of addresses is 256 × 128 = **32768**. For this group, each customer needs 128 addresses. This means the suffix length is $\log_2 128 = 7$. The prefix length is then 32 – 7 = 25. The addresses are:

1st customer:	**150.80.0.0/25**	**to**	**150.80.0.127/25**
2nd customer:	**150.80.0.128/25**	**to**	**150.80.0.255/25**
...	...		...
200th customer:	**150.80.99.128/25**	**to**	**150.80.99.255/25**
Unused addresses	**150.80.100.0**	**to**	**150.80.127.255**

Total Addresses in group 1 = 256 × 128 = **32768** Used = 200 × 128 = **25600.**
Reserved: **7168**, which can be assigned to 56 businesses of this size.

Group 2

In the second group, we have 400 business. We augment this number to 512 (the next number after 400 that is a power of 2) to let 112 more customer of this kind in the future. The total number of addresses is = 512 × 16 = **8192**. For this group, each customer needs 16 addresses. This means the suffix length is 4 $\log_2 16 = 4$.

The prefix length is then 32 – 4 = 28. The addresses are:

1st customer:	150.80.128.0/28	to	150.80.128.15/28
2nd customer:	150.80.128.16/28	to	150.80.128.31/28
...	...		...
400th customer:	150.80.152.240/28	to	150.80.152.255/28
Unused addresses	150.80.153.0	to	150.80.159.255

Total Addresses in group 2 = 512 × 16 = **8192** Used = 400 × 16 = **6400**
Reserved: **1792**, which can be assigned to 112 businesses of this size.

Group 3

In the third group, we have 2000 households. We augment this number to 2048 (the next number after 2000 that is a power of 2) to let 48 more customer of this kind in the future. The total number of addresses is = 2048 × 4 = **8192**. For this group, each customer needs 4 addresses. This means the suffix length is 2 $\log_2 4$ = 2. The prefix length is then 32 – 2 = 30. The addresses are:

1st customer:	150.80.160.0/30	to	150.80.160.3/30
2nd customer:	150.80.160.4/30	to	150.80.160.7/30
...	...		...
2000th customer:	150.80.191.60/30	to	150.80.191.63/30
Unused addresses	150.80.191.64	to	150.80.191.255

Total Addresses in group 3 = 2048 × 4 = **8192** Used = 2000 × 4 = **8000**
Reserved: **192**, which can be assigned to 48 households.

Reserved Range

In the reserved range, we have 16384 address that are totally unused.

Note that we have unused addresses in each group and a large range of unused addresses in the reserved range.

2.b) Explain RARP and BOOTP. And differentiate them. **6M**

Explain RARP, BOOTP
Figure
Differentiation

2.c) For the given routing table draw the topology of the network **6M**

Figure

3.a) Explain three commonly used strategies for forwarding packets. **4M**

Figures

The three common forwarding methods used today are: next-hop, network-specific, and default methods. In the *next-hop method*, the routing table holds only the address of the next hop for each destination. In the *network-specific* method, the routing table holds only one entry that defines the address of the destination network instead of all hosts on that network. In the *default method*, a host sends all packets that are going out of the network to a specific router called the default router.

3.b) An IPv4 datagram has arrived with the following information in the header (in hexadecimal)

0x45 00 00 54 00 03 58 50 20 06 00 00 7C 4E 03 02 B4 0E 0F 02

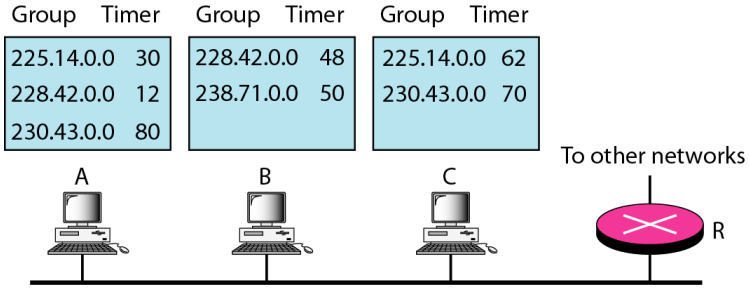
VER = 0x4 = **4**
HLEN =0x5 = 5 → 5 × 4 = **20**
Service =0x00 = **0**
Total Length = 0x0054 = **84**
Identification = 0x0003 = **3**
Flags and Fragmentation = 0x0000 → D = **0** M= **0** offset = **0**
Time to live = 0x20 = **32**
Protocol = 0x06 = **6**
Checksum = 0x5850
Source Address: 0x7C4E0302 = **124.78.3.2**
Destination Address: 0xB40E0F02 = **180.14.15.2**

We can then answer the questions:

a. If we calculate the checksum, we get 0x0000. *The packet is not corrupted.*
b. Since the length of the header is 20 bytes, *there are no options.*
c. Since *M* = 0 and *offset* = 0, *the packet is not fragmented.*
d. The total length is 84. *Data size is 64 bytes (84 –20).*
e. Since the value of *time to live* = 32, *the packet may visit up to 32 more routers.*
f. *The identification number of the packet is 3.*
g. *The type of service is normal.*

3.c) Explain IGMP highlighting on delayed response. Change the multicast IP address 236.212.24.9 to an Ethernet multicast address **8M**

Explanation of Delayed response with figure



The rightmost 3 bytes in hexadecimal is D4:18:09. We need to subtract 8 from the leftmost digit, resulting in 54:18:09.
We add the result of part a to the Ethernet multicast starting address. The result is

01:00:5E:54:18:09